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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/027,476	12/21/2001	Jimmy Kuo Chen	276440-21	9965

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EXAMINER

NGUYEN, DONGHAID

ART UNIT PAPER NUMBER

3729

DATE MAILED: 09/09/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/027,476

Applicant(s)

CHEN, JIMMY KUO

Examiner

Donghai D. Nguyen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 18 July 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-12 and 16-23 is/are pending in the application.
- 4a) Of the above claim(s) 23 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-12 and 16-22 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on July 18, 2005 has been entered.

Election/Restrictions

2. This application contains claims directed to the following patentably distinct species of the claimed invention:

Species A, drawn to Fig. 4, readable on claims 1-12 and 16-22.

Species B, drawn to Fig. 6, readable on claim 23

Applicant is required under 35 U.S.C. 121 to elect a single disclosed species for prosecution on the merits to which the claims shall be restricted if no generic claim is finally held to be allowable. Currently, there is no generic claim.

Applicant is advised that a reply to this requirement must include an identification of the species that is elected consonant with this requirement, and a listing of all claims readable thereon, including any claims subsequently added. An argument that a claim is allowable or that all claims are generic is considered nonresponsive unless accompanied by an election.

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Upon the allowance of a generic claim, applicant will be entitled to consideration of claims to additional species which are written in dependent form or otherwise include all the limitations of an allowed generic claim as provided by 37 CFR 1.141. If claims are added after the election, applicant must indicate which are readable upon the elected species. MPEP § 809.02(a).

Should applicant traverse on the ground that the species are not patentably distinct, applicant should submit evidence or identify such evidence now of record showing the species to be obvious variants or clearly admit on the record that this is the case. In either instance, if the examiner finds one of the inventions unpatentable over the prior art, the evidence or admission may be used in a rejection under 35 U.S.C. 103(a) of the other invention.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) The invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1-7, 10, 11, and 16 are rejected under 35 U.S.C. 102(b) as being anticipated by US Patent 4,983,804 to Chan et al.

Regarding claims 1 and 16, Chan et al disclose a method for heat treating a plurality of conductive interconnect structures (17/18 or 30-33) attached to a substrate (11/12), the method comprising the steps of: providing a contactor comprising a substrate (insulation substrate 11/12) and a plurality of conductive interconnect structures (17/18 or

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30-33 see Figs. 2 or 4); placing the contactor in an oscillating electromagnetic field, the oscillating electromagnetic field heating the interconnect structure without substantially heating the substrate (Col. 2, lines 46-48); maintaining the contactor in the field heating field until each of the interconnect structures obtains a defined heat-treatment temperature substantially greater than an ambient temperature for a predetermined period of time sufficient to permanently improve a mechanical operating property of the interconnect structures (Col. 3, lines 18-24). Note that the interconnect structures i.e., solders are melt and bonded to the pads, therefore the interconnect structures changed and improved their physical/mechanical operative.

Regarding claims 2-6 and 10-11, Chan et al disclose the interconnect structures comprising ferromagnetic material, i.e., nickel-cobalt alloy (claims 2-3, see Col. 3, lines 3-5) and tuning the oscillating electromagnetic field to a resonant frequency between 10 MHz-15 MHz (claims 10 and 11) for selectively heating the ferromagnetic material (claim 4) to temperature greater than 800° C and 1300° C (claims 5 and 6, see Figs. 3 and 5-12).

Regarding claim 7, Fig. 2 or 4 of Chan et al shows the oscillating electromagnetic field generates between a pair of plates.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 1-11, 13-16 and 18-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent 6,150,186 to Chen et al in view of either US Patent 4,983,804 to Chan et al or US Patent 5,418,811 to Ruffini et al.

Regarding claims 1, 16, and 18-22, Chen et al disclose a method for heat treating a plurality of conductive interconnect structures attached to a substrate, the method comprising the steps of: providing a contactor (Figs. 2 or 3) comprising a substrate (semiconductor wafer 202) and a plurality of conductive interconnect structures (wires/springs 204/208/212) each of the interconnect structures is attached to a terminal on the substrate and comprises a contact tip disposed away from the substrate (See Figs. 2-3); placing the contactor in heating field; maintaining the contactor in the field heating field until each of the interconnect structures obtains a defined heat-treatment temperature substantially greater than an ambient temperature for a predetermined period of time sufficient to permanently improve a mechanical operating property of the interconnect structure (Fig. 1 and Abstract, lines 1-3); removing the contactor from the heating field (it is inherent that the contact be removed from heating field to room temperature for cooling down); and cooling the interconnect structures to the ambient temperature (Col. 3, lines Col. 11, lines 39-44).

Chen et al is silent regarding how the contactor is subjected to heat treatment. Chan et al teach the step of placing an electrical device (Figs. 2/4) in an oscillating electromagnetic field for heating the interconnect structures (30-35) without substantially heating the substrate (Col. 2, lines 46-48). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Chen et al's method

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for heat treatment the contact by placing the contactor in the oscillating electromagnetic field as taught by Chan et al for heating the interconnect structures without substantially heating the substrate.

Additionally, Ruffini et al teach the using oscillating electromagnetic field for heating, annealing, heat treatment/hardening in metal working industry is well known in the art because the oscillating electromagnetic field heating provides many advantages such as heating is localized, providing uniform high quality heat treatment etc. (See Ruffini et al, Col. 1, lines 37-61). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to utilizing the oscillating electromagnetic field for heating the interconnect structures of Chen to obtain the desired improvement of mechanical properties of the interconnect structures.

The limitations of claims 16 and 18-22 also met as set forth above.

Regarding claims 10 and 11,

Regarding claims 2-3, Chen et al disclose the interconnect structures are comprised of a ferromagnetic material which is a nickel-cobalt alloy (Col. 6, lines 1-19).

Regarding claims 4-7 and 10-11, Chen et al do not teach the step of tuning the oscillating electromagnetic field between a pair of plates (claim 7), to a resonant frequency of a field generator circuit (claim 10), and to frequency about 10 MHz-15MHz (claim 11) for selectively heating the ferromagnetic material (claim 4) and obtaining the heat treatment temperature greater than 800° C and 1300° C (claims 5 and 6). Chan et al disclose tuning the oscillating electromagnetic field between a pair of plates (23, 24), to a resonant frequency of a field generator circuit, and to frequency about 10 MHz-15MHz that selectively heat the ferromagnetic material and obtain the heat treatment temperature

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greater than 800° C and 1300° C (see Figs. 3, 5-12) for preventing damage to other sensitive component/substrate (Col. 3, lines 58-60). Therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize the Chan et al heating method onto the method invention of Chen et al for benefit of preventing damage to the associated component/substrate.

Regarding limitation of claims 8 and 9. It would have been an obvious matter of design choice to choose coil element i.e., size, shape, and configuration, since Applicant has not disclosed that the claimed specifics coil shape including copper tube or hairpin coil for generating the oscillating electromagnetic field would solve any stated problem or for any particular purpose and it appears that the invention would perform equally well with the coil element (23/24) of Chan et al reference.

7. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chen et al in view of Chan et al as modified and applied above, and further in view of US Patent 5,340,537 to Barrett.

Chen et al/Chan et al as modified and relied upon above do not teach the applying a heat-indicating paint to the plurality of microelectronic structures prior to the maintaining step as recited in claim 12. Barrett teaches the step of applying a heat-indicating paint to the plurality of microelectronic structures for measuring a temperature (col. 3, lines 9-17). Therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize the teaching applying a heat-indicating paint to the microelectronic structures as taught by Barrett onto the modified

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method invention of Chen et al/Chan et al in order to facilitate the fabrication process including measuring and controlling of the temperature.

8. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chen et al in view of Chan et al as modified and applied above, and further in view of US patent 5,476,211 to Khandros.

Chen et al/Chan et al as modified and relied upon above do not teach the associated contactor comprising an interposer and the conductive interconnect structures are disposed on the opposing sides of the substrate as recited in claim 17. Khandros discloses the contactor (59) comprising an interposer (Figs. 18-21) and the conductive interconnect structures are disposed on the opposing sides of the substrate for electrically interconnecting between two substrates of surfaces of substrate (col. 15, lines 65-66 and Col. 16, lines 8-16). It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide the contactor having the configuration requirement as describe above as taught by Khandros onto the modified method of Chen et al in order to obtain an interconnecting structure between two surfaces.

Response to Arguments

9. Applicant's arguments with respect to claims 1-12 and 16-22 have been considered but are moot in view of the new ground(s) of rejection.

10. Applicant's arguments filed July 18, 2005 have been fully considered in view of the following rebuttal.

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a) Applicant argues that “Chen does not teach heating the interconnect structures without substantially heating the substrate” (“Remarks” page 5, 3rd paragraph). The Examiner disagrees for the following reasons: Applicant refers to the discussion at Col. 2, lines 46-48 of Chen reference for the teaching of heating the interconnection without heating the substrate such doing would preventing thermal heating other structural elements including substrate (10/11). That is surrounding the localized heating interconnect structures (see in details at Col. 3, lines 24-27).

b) In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

c) In response to applicant's argument that there is no suggestion to combine the references (see “Remarks” page 6 and 7), the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, Chen et al teach the heat treatment on the interconnect structures provide improvement the mechanical properties of the interconnect structures and Chan et al teach the step of

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localizing heat treatment the interconnect structures without affecting other components i.e. substrate surround the interconnect structure. Furthermore, Ruffini et al also teach the heat treatment by oscillating electromagnetic field for localized heat treatment on metallic structures (see Col. 1, lines 37-61). These teachings are well known in the art as to provide many advantages over convection heating such as utilize the oscillating electromagnetic field for heating an interconnecting element without effecting its substrate as described by Chen et al or Ruffini above.

Conclusion

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The prior art reference cited for the teachings of oscillating electromagnetic field in heat treatment metallic articles, etc.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Donghai D. Nguyen whose telephone number is (571)-272-4566. The examiner can normally be reached on Monday-Friday (9:00-6:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Peter D. Vo can be reached on (571)-272-4690. The fax phone number for the organization where this application or proceeding is assigned is **571-273-8300**.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

DN
September 6, 2005


MINHTRINH
PRIMARY EXAMINER